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Photoluminescence of $CaMoO_4$ powder processed in a microwave-hydrothermal

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Abstract – This communication reports the synthesis of $CaMoO_4$ powders obtained by the coprecipitation method and processed in a microwave-hydrothermal (MH) at 140°C for 1h. These powders were analyzed by X-ray diffraction (XRD), photoluminescence (PL). XRD patterns showed that the $CaMoO_4$ present a tetragonal powellite-type structure and free of intermediary phases. The powders exhibited a green photoluminescence emission at room temperature when exited by 350 nm wavelength.

$CaMoO_4$ has attracted the attention of different scientific and technological fields because of its wide potential for industrial applications, mainly including: electro-optical devices, solid state lasers, scintillators, microwave applications, fluorescent lamps, negative electrodes for Li-on batteries, cryogenic scintillation detectors for search of ^{100}Mo double beta decay and so on [1].

The powders were obtained by the coprecipitation method and processed by MH in the presence of ethylene glycol (ETG). Then 5 mL of ammonium hydroxide (NH_4OH) (30% in NH_3, Synth) was added into the solution until the pH value reached to 10. Afterwards, the aqueous solution was stirred and heated for some minutes. In the sequence, this mixture was transferred into a Teflon autoclave, which was sealed and placed into a domestic microwave-hydrothermal at 140°C for 1 h. The heating rate in this system was fixed at 25ºC/min and the pressure into the autoclave was stabilized at 294 kPa. After microwave-hydrothermal processing, the autoclave was cooled at room temperature naturally. The resulting solution was washed with deionized water several times to neutralize the solution pH (≈7). Finally, the white precipitates were collected and dried in a conventional furnace at 75ºC for some hours. The Figure 1 shows a typical XRD pattern of $CaMoO_4$ powders processed in a microwave hydrothermal at 140°C for 1h. All diffraction peaks can be assigned to the tetragonal structure with space group I41/*a*. No intermediary crystalline phases were verified. The strong and sharp peaks indicate that MH method is able to form $CaMoO_4$ powders with high crystallization degree. Figure 2 shows the PL spectra of powders $CaMoO_4$. As can be seen in this figure, the general aspect of the PL curve is a broad band covering a large part of the visible electromagnetic spectrum (green emission) [1] e [2] .

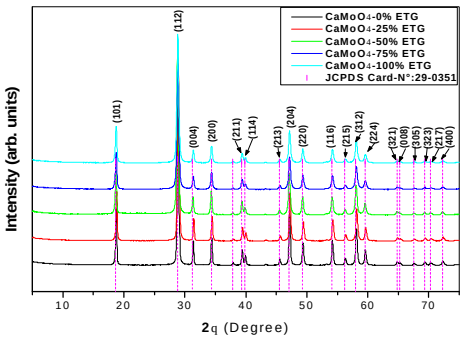

Fig. 1: XRD patterns of $CaMoO_4$ powders processed in a microwave-hydrothermal at 140°C for 1 h.

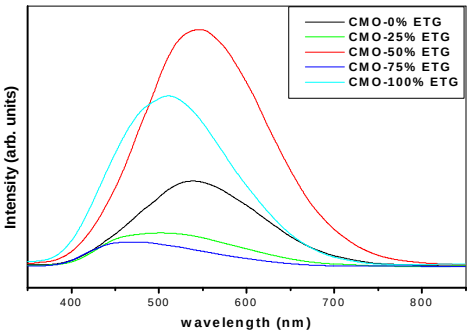

Fig. 2: PL spectrum at room temperature of $CaMoO_4$ powders excited with 350 nm wavelength of an argon ion laser.

References

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